Analytical Laboratory

13339 Hagers Ferry Road
Huntersville, NC 28078-7929
McGuire Nuclear Complex - MG03A2
Phone: 980-875-5245 Fax: 980-875-4349

Order Summary Report

Order Number: **J13030385**

Project Name:

Customer Name(s): Bill K., Ron L., Don S.

Customer Address: 253 Plant Allen Road

Belmont, NC 28012

Lab Contact: Jason C Perkins Phone: 980-875-5348

Report Authorized By: (Signature)

Digitally signed by jay perkins
DN: cn=jay perkins, o=Analytical Lab, ou, email=jay.perkins@duke-energy.com, c=US
Date: 2013.04.22 13:41:29 -04'00'

Jason C Perkins

Date: 4/22/2013

Program Comments:

Please contact the Program Manager (Jason C Perkins) with any questions regarding this report.

Data Flags & Calculations:

Any analytical tests or individual analytes within a test flagged with a Qualifier indicate a deviation from the method quality system or quality control requirement. The qualifier description is found at the end of the Certificate of Analysis (sample results) under the qualifiers heading. All results are reported on a dry weight basis unless otherwise noted. Subcontracted data included on the Duke Certificate of Analysis is to be used as information only. Certified vendor results can be found in the subcontracted lab final report. Duke Energy Analytical Laboratory subcontracts analyses to other vendor laboratories that have been qualified by Duke Energy to perform these analyses except where noted.

Data Package:

This data package includes analytical results that are applicable only to the samples described in this narrative. An estimation of the uncertainty of measurement for the results in the report is available upon request. This report shall not be reproduced, except in full, without the written consent of the Analytical Laboratory. Please contact the Analytical laboratory with any questions. The order of individual sections within this report is as follows:

Job Summary Report, Sample Identification, Technical Validation of Data Package, Analytical Laboratory Certificate of Analysis, Analytical Laboratory QC Reports, Sub-contracted Laboratory Results, Customer Specific Data Sheets, Reports & Documentation, Customer Database Entries, Test Case Narratives, Chain of Custody (COC)

Certification:

The Analytical Laboratory holds the following State Certifications : North Carolina (DENR) Certificate #248, South Carolina (DHEC) Laboratory ID # 99005. Contact the Analytical Laboratory for definitive information about the certification status of specific methods.

Sample ID's & Descriptions:

Sample ID	Plant/Station	Collection Date and Time	Collected By	Sample Description
2013006600	ALLEN	28-Mar-13 1:50 PM	PAT NOBLE	FGD Purge Eff
2013006601	ALLEN	28-Mar-13 1:46 PM	PAT NOBLE	EQ Tank Eff
2013006602	ALLEN	28-Mar-13 1:38 PM	PAT NOBLE	BioReactor 1 Inf
2013006603	ALLEN	28-Mar-13 1:40 PM	PAT NOBLE	BioReactor 2 Inf
2013006604	ALLEN	28-Mar-13 1:43 PM	PAT NOBLE	BioReactor 2 Eff
2013006605	ALLEN	28-Mar-13 2:00 PM	PAT NOBLE	Filter Blk
2013006606	ALLEN	25-Mar-13 10:00 AM	PAT NOBLE	TRIP BLANK

7 Total Samples

Technical Validation Review

Checklist:

COC and .pdf report are in agreement with sample totals and analyses (compliance programs and procedures).	☑ Yes	☐ No
All Results are less than the laboratory reporting limits.	☐ Yes	☑ No
All laboratory QA/QC requirements are acceptable.	☑ Yes	☐ No

Report Sections Included:

- ☑ Job Summary Report
- ☑ Sample Identification
- ☑ Technical Validation of Data Package
- ☑ Analytical Laboratory Certificate of Analysis
- ☐ Analytical Laboratory QC Report
- ☑ Sub-contracted Laboratory Results
- ☐ Customer Specific Data Sheets, Reports, & Documentation
- ☐ Customer Database Entries
- ☑ Chain of Custody
- ☑ Electronic Data Deliverable (EDD) Sent Separately

Reviewed By: DBA Account Date: 4/22/2013

Certificate of Laboratory Analysis

This report shall not be reproduced, except in full.

Order # J13030385

Site: FGD Purge Eff **Sample #: 2013006600**

Collection Date: 28-Mar-13 1:50 PM Matrix: OTHER

Analyte	Result	Units	Qualifiers	RDL	DF	Method	Analysis Date/Time	Analyst
INORGANIC IONS BY IC								
Bromide	**380**	mg/L		10	100	EPA 300.0	04/16/2013 01:30	JAHERMA
MERCURY (COLD VAPOR) IN WATER								
Mercury (Hg)	**57.3**	ug/L		2.5	50	EPA 245.1	04/04/2013 13:18	AGIBBS
TOTAL RECOVERABLE METALS BY ICP								
Boron (B)	**43.9**	mg/L		0.5	10	EPA 200.7	04/12/2013 13:43	DJSULL1
DISSOLVED METALS BY ICP-MS								
Selenium (Se)	**2420**	ug/L		20	20	EPA 200.8	04/08/2013 14:42	KRICHAR
TOTAL RECOVERABLE METALS BY ICP-MS								
Arsenic (As)	**145**	ug/L		10	10	EPA 200.8	04/10/2013 13:59	KRICHAR
Cadmium (Cd)	**< 10**	ug/L		10	10	EPA 200.8	04/10/2013 13:59	KRICHAR
Chromium (Cr)	**133**	ug/L		10	10	EPA 200.8	04/10/2013 13:59	KRICHAR
Copper (Cu)	**154**	ug/L		10	10	EPA 200.8	04/10/2013 13:59	KRICHAR
Nickel (Ni)	**161**	ug/L		10	10	EPA 200.8	04/10/2013 13:59	KRICHAR
Selenium (Se)	**4810**	ug/L		20	20	EPA 200.8	04/10/2013 13:59	KRICHAR
Silver (Ag)	**< 10**	ug/L		10	10	EPA 200.8	04/10/2013 13:59	KRICHAR
Zinc (Zn)	**195**	ug/L		10	10	EPA 200.8	04/10/2013 13:59	KRICHAR
SELENIUM SPECIATION - (Analysis Performed by Applied Speciation and Consulting, LLC)								
Vendor Parameter	**Complete**					Vendor Method		V_AS&C
TOTAL DISSOLVED SOLIDS								
TDS	**11000**	mg/L		200	1	SM2540C	04/08/2013 12:43	TJA7067

Site: EQ Tank Eff **Sample #: 2013006601**

Collection Date: 28-Mar-13 1:46 PM Matrix: OTHER

Analyte	Result	Units	Qualifiers	RDL	DF	Method	Analysis Date/Time	Analyst
MERCURY (COLD VAPOR) IN WATER								
Mercury (Hg)	**47.2**	ug/L		2.5	50	EPA 245.1	04/04/2013 13:20	AGIBBS
TOTAL RECOVERABLE METALS BY ICP								
Boron (B)	**39.4**	mg/L		0.5	10	EPA 200.7	04/12/2013 13:47	DJSULL1
DISSOLVED METALS BY ICP-MS								
Selenium (Se)	**1900**	ug/L		10	10	EPA 200.8	04/08/2013 14:21	KRICHAR

Certificate of Laboratory Analysis

Order # J13030385

Site: EQ Tank Eff **Sample #: 2013006601**

Collection Date: 28-Mar-13 1:46 PM Matrix: OTHER

Analyte	Result	Units	Qualifiers	RDL	DF	Method	Analysis Date/Time	Analyst
TOTAL RECOVERABLE METALS BY ICP-MS								
Arsenic (As)	**117**	ug/L		10	10	EPA 200.8	04/10/2013 13:24	KRICHAR
Cadmium (Cd)	**< 10**	ug/L		10	10	EPA 200.8	04/10/2013 13:24	KRICHAR
Chromium (Cr)	**105**	ug/L		10	10	EPA 200.8	04/10/2013 13:24	KRICHAR
Copper (Cu)	**125**	ug/L		10	10	EPA 200.8	04/10/2013 13:24	KRICHAR
Nickel (Ni)	**132**	ug/L		10	10	EPA 200.8	04/10/2013 13:24	KRICHAR
Selenium (Se)	**4200**	ug/L		10	10	EPA 200.8	04/10/2013 13:24	KRICHAR
Silver (Ag)	**< 10**	ug/L		10	10	EPA 200.8	04/10/2013 13:24	KRICHAR
Zinc (Zn)	**173**	ug/L		10	10	EPA 200.8	04/10/2013 13:24	KRICHAR

Site: BioReactor 1 Inf **Sample #: 2013006602**

Collection Date: 28-Mar-13 1:38 PM Matrix: OTHER

Analyte	Result	Units	Qualifiers	RDL	DF	Method	Analysis Date/Time	Analyst
Mercury by EPA 200.8 - (Analysis Performed by Applied Speciation and Consulting, LLC)								
Vendor Parameter	**Complete**	ug/l				Vendor Method		V_AS&C
TOTAL RECOVERABLE METALS BY ICP								
Boron (B)	**41.5**	mg/L		0.5	10	EPA 200.7	04/12/2013 13:51	DJSULL1
DISSOLVED METALS BY ICP-MS								
Selenium (Se)	**1150**	ug/L		10	10	EPA 200.8	04/08/2013 14:24	KRICHAR
TOTAL RECOVERABLE METALS BY ICP-MS								
Arsenic (As)	**< 10**	ug/L		10	10	EPA 200.8	04/10/2013 13:28	KRICHAR
Cadmium (Cd)	**< 10**	ug/L		10	10	EPA 200.8	04/10/2013 13:28	KRICHAR
Chromium (Cr)	**< 10**	ug/L		10	10	EPA 200.8	04/10/2013 13:28	KRICHAR
Copper (Cu)	**< 10**	ug/L		10	10	EPA 200.8	04/10/2013 13:28	KRICHAR
Nickel (Ni)	**10.3**	ug/L		10	10	EPA 200.8	04/10/2013 13:28	KRICHAR
Selenium (Se)	**1190**	ug/L		10	10	EPA 200.8	04/10/2013 13:28	KRICHAR
Silver (Ag)	**< 10**	ug/L		10	10	EPA 200.8	04/10/2013 13:28	KRICHAR
Zinc (Zn)	**< 10**	ug/L		10	10	EPA 200.8	04/10/2013 13:28	KRICHAR
SELENIUM SPECIATION - (Analysis Performed by Applied Speciation and Consulting, LLC)								
Vendor Parameter	**Complete**					Vendor Method		V_AS&C

Certificate of Laboratory Analysis

This report shall not be reproduced, except in full.

Order # J13030385

Site: BioReactor 2 Inf **Sample #: 2013006603**

Collection Date: 28-Mar-13 1:40 PM Matrix: OTHER

Analyte	Result	Units	Qualifiers	RDL	DF	Method	Analysis Date/Time	Analyst
Mercury by EPA 200.8 - (Analysis Performed by Applied Speciation and Consulting, LLC)								
Vendor Parameter	**Complete**	ug/l				Vendor Method		V_AS&C
TOTAL RECOVERABLE METALS BY ICP								
Boron (B)	**44.2**	mg/L		0.5	10	EPA 200.7	04/12/2013 13:55	DJSULL1
TOTAL RECOVERABLE METALS BY ICP-MS								
Arsenic (As)	**< 10**	ug/L		10	10	EPA 200.8	04/10/2013 13:31	KRICHAR
Cadmium (Cd)	**< 10**	ug/L		10	10	EPA 200.8	04/10/2013 13:31	KRICHAR
Chromium (Cr)	**< 10**	ug/L		10	10	EPA 200.8	04/10/2013 13:31	KRICHAR
Copper (Cu)	**< 10**	ug/L		10	10	EPA 200.8	04/10/2013 13:31	KRICHAR
Nickel (Ni)	**< 10**	ug/L		10	10	EPA 200.8	04/10/2013 13:31	KRICHAR
Selenium (Se)	**68.7**	ug/L		10	10	EPA 200.8	04/10/2013 13:31	KRICHAR
Silver (Ag)	**< 10**	ug/L		10	10	EPA 200.8	04/10/2013 13:31	KRICHAR
Zinc (Zn)	**< 10**	ug/L		10	10	EPA 200.8	04/10/2013 13:31	KRICHAR

Site: BioReactor 2 Eff **Sample #: 2013006604**

Collection Date: 28-Mar-13 1:43 PM Matrix: OTHER

Analyte	Result	Units	Qualifiers	RDL	DF	Method	Analysis Date/Time	Analyst
INORGANIC IONS BY IC								
Bromide	**390**	mg/L		10	100	EPA 300.0	04/16/2013 01:49	JAHERMA
Mercury by EPA 200.8 - (Analysis Performed by Applied Speciation and Consulting, LLC)								
Vendor Parameter	**Complete**	ug/l				Vendor Method		V_AS&C
TOTAL RECOVERABLE METALS BY ICP								
Boron (B)	**43.7**	mg/L		0.5	10	EPA 200.7	04/12/2013 13:59	DJSULL1
TOTAL RECOVERABLE METALS BY ICP-MS								
Arsenic (As)	**< 5**	ug/L		5	5	EPA 200.8	04/10/2013 13:35	KRICHAR
Cadmium (Cd)	**< 5**	ug/L		5	5	EPA 200.8	04/10/2013 13:35	KRICHAR
Chromium (Cr)	**< 5**	ug/L		5	5	EPA 200.8	04/10/2013 13:35	KRICHAR
Copper (Cu)	**< 5**	ug/L		5	5	EPA 200.8	04/10/2013 13:35	KRICHAR
Nickel (Ni)	**< 5**	ug/L		5	5	EPA 200.8	04/10/2013 13:35	KRICHAR
Selenium (Se)	**5.65**	ug/L		5	5	EPA 200.8	04/10/2013 13:35	KRICHAR
Silver (Ag)	**< 5**	ug/L		5	5	EPA 200.8	04/10/2013 13:35	KRICHAR
Zinc (Zn)	**< 5**	ug/L		5	5	EPA 200.8	04/10/2013 13:35	KRICHAR
SELENIUM SPECIATION - (Analysis Performed by Applied Speciation and Consulting, LLC)								
Vendor Parameter	**Complete**					Vendor Method		V_AS&C

Certificate of Laboratory Analysis

Order # J13030385

Site: Filter Blk — **Sample #: 2013006605**
Collection Date: 28-Mar-13 2:00 PM — Matrix: OTHER

Analyte	Result	Units	Qualifiers	RDL	DF	Method	Analysis Date/Time	Analyst
DISSOLVED METALS BY ICP-MS								
Selenium (Se)	**< 1**	ug/L		1	1	EPA 200.8	04/08/2013 14:00	KRICHAR

Site: TRIP BLANK — **Sample #: 2013006606**
Collection Date: 25-Mar-13 10:00 AM — Matrix: OTHER

Analyte	Result	Units	Qualifiers	RDL	DF	Method	Analysis Date/Time	Analyst
TOTAL RECOVERABLE METALS BY ICP								
Boron (B)	**< 0.05**	mg/L		0.05	1	EPA 200.7	04/12/2013 13:20	DJSULL1
TOTAL RECOVERABLE METALS BY ICP-MS								
Arsenic (As)	**< 1**	ug/L		1	1	EPA 200.8	04/10/2013 12:53	KRICHAR
Cadmium (Cd)	**< 1**	ug/L		1	1	EPA 200.8	04/10/2013 12:53	KRICHAR
Chromium (Cr)	**< 1**	ug/L		1	1	EPA 200.8	04/10/2013 12:53	KRICHAR
Copper (Cu)	**< 1**	ug/L		1	1	EPA 200.8	04/10/2013 12:53	KRICHAR
Nickel (Ni)	**< 1**	ug/L		1	1	EPA 200.8	04/10/2013 12:53	KRICHAR
Selenium (Se)	**< 1**	ug/L		1	1	EPA 200.8	04/10/2013 12:53	KRICHAR
Silver (Ag)	**< 1**	ug/L		1	1	EPA 200.8	04/10/2013 12:53	KRICHAR
Zinc (Zn)	**< 1**	ug/L		1	1	EPA 200.8	04/10/2013 12:53	KRICHAR

APPLIED SPECIATION AND CONSULTING, LLC

18804 Northcreek Parkway Bothell, WA, 98011
Tel: (425) 483-3300 Fax: (425) 483-9818
www.appliedspeciation.com

April 18, 2013

Jay Perkins
Duke Energy Analytical Laboratory
Mail Code MGO3A2 (Building 7405)
13339 Hagers Ferry Rd.
Huntersville, NC 28078
(704) 875-5245

Project: Allen - FGD WWTS (Bi-Monthly Sampling) (LIMS #J13030385)

Dear Mr. Perkins,

Attached is the report associated with six (6) aqueous samples submitted for total mercury and selenium speciation analysis on April 2, 2013. The samples were received in a sealed cooler at -0.5°C on April 3, 2013. Selenium speciation analysis was performed via ion chromatography inductively coupled plasma collision reaction cell mass spectrometry (IC-ICP-CRC-MS). Mercury quantitation was performed via cold vapor inductively coupled plasma mass spectrometry (CV-ICP-MS). Any issues associated with the analysis are addressed in the following report.

If you have any questions, please feel free to contact me at your convenience.

Sincerely,

Russell Gerads
Vice President
Applied Speciation and Consulting, LLC

Applied Speciation and Consulting, LLC

Report prepared for:

Jay Perkins
Duke Energy Analytical Laboratory
Mail Code MGO3A2 (Building 7405)
13339 Hagers Ferry Rd.
Huntersville, NC 28078

Project: Allen - FGD WWTS (Bi-Monthly Sampling) (LIMS #J13030385)

April 18, 2013

1. Sample Reception

Three (3) aqueous samples in 125mL HDPE bottles (provided by Applied Speciation and Consulting) were submitted for selenium speciation analysis on April 2, 2013. Three additional samples in a 40ml borosilicate glass bottles (also provided by Applied Speciation and Consulting) were submitted for total mercury quantitation. All samples were received on April 3, 2013 in a sealed container at -0.5°C.

All samples were received in a laminar flow clean hood, void of trace metals contamination and ultra-violet radiation, and were designated discrete sample identifiers. The 40mL borosilicate glass vials submitted for total mercury were preserved with bromine monochloride (BrCl) solution. The resulting samples were stored in a secure polyethylene container, known to be free from trace metals contamination, until the analyses could be performed.

An aliquot of each sample requiring selenium speciation evaluation was filtered (0.45µm) and each filtrate was stored in a secure, monitored cryofreezer (maintained at a temperature of -80°C) until selenium speciation analysis could be performed via ion chromatography inductively coupled plasma collision reaction cell mass spectrometry (IC-ICP-CRC-MS).

2. Sample Preparation

All sample preparation is performed in laminar flow clean hoods known to be free from trace metals contamination. All applied water for dilutions and sample preservatives are monitored for contamination to account for any biases associated with the sample results.

Total Mercury Quantitation by CV-ICP-MS All samples and preparation blanks for total mercury quantitation were preserved with 2% (v/v) BrCl. The resulting samples were analyzed for mercury via cold vapor inductively coupled plasma mass spectrometry (CV-ICP-MS).

Selenium Speciation Analysis by IC-ICP-CRC-MS Prior to analysis, an aliquot of each sample was filtered with a syringe filter (0.45µm) and injected directly into a sealed autosampler vial. No further sample preparation was performed as any chemical alteration of a sample may shift the equilibrium of the system, resulting in changes in speciation ratios.

3. Sample Analysis

All sample analysis is preceded by a minimum of a five-point calibration curve spanning the entire concentration range of interest. Calibration curves are performed at the beginning of each analytical day. All calibration curves, associated with each species of interest, are standardized by linear regression resulting in a response factor. All sample results are **instrument blank corrected** to account for any operational biases associated with the analytical platform.

Prior to sample analysis, all calibration curves are verified using second source standards which are identified as initial calibration verification standards (ICV).

Ongoing instrument performance is identified by the analysis of continuing calibration verification standards (CCV) and continuing calibration blanks (CCB) at a minimum interval of every ten analytical runs.

Total Mercury Quantitation by CV-ICP-MS The sample fractions for total mercury quantitation were analyzed by cold vapor inductively coupled plasma mass spectrometry (CV-ICP-MS) on April 5, 2013. Aliquots of each sample are reacted with a reductant in-line and transported to a gas-liquid separator. The volatile elemental mercury that is formed is then swept by a stream of argon gas into a radio frequency (RF) plasma where energy-transfer processes cause desolvation, atomization, and ionization. The ions are extracted from the plasma through a differentially-pumped vacuum interface and separated on the basis of their mass-to-charge ratio (m/z) by a mass spectrometer. A solid-state detector detects ions transmitted through the mass analyzer and the resulting current is processed by a data handling system.

Selenium Speciation Analysis by IC-ICP-CRC-MS Each sample for selenium speciation analysis was analyzed by ion chromatography inductively coupled plasma collision reaction cell mass spectrometry (IC-ICP-CRC-MS) on April 17, 2013. An aliquot of each sample is injected onto an anion exchange column and mobilized by a basic (pH > 7) gradient. The eluting selenium species are then introduced into a radio frequency (RF) plasma where energy-transfer processes cause desolvation, atomization, and ionization. The ions are extracted from the plasma through a differentially-pumped vacuum interface and travel through a pressurized chamber (CRC) containing a reaction gas which preferentially reacts with interfering ions of the same target mass to charge ratios (m/z). A solid-state detector

detects ions transmitted through the mass analyzer and the resulting current is processed by a data handling system.

Retention times for each eluting species are compared to known standards for species identification.

4. Analytical Issues

The overall analyses went well and no significant analytical issues were encountered. All quality control parameters associated with the samples were within acceptance limits.

The estimated method detection limits (eMDLs) for selenite, selenate, and selenocyanate are generated from replicate analyses of the lowest standard in the calibration curve. Not all selenium species are present in preparation blanks; therefore, eMDL calculations based on preparation blanks are artificially biased low.

The eMDL for methylseleninic acid and selenomethionine is calculated from the average eMDL of selenite, selenate, and selenocyanate. The calibration does not contain methylseleninic acid or selenomethionine due to impurities in these standards which would bias the results for other selenium species.

The eMDL for mercury has been calculated using the standard deviation of the preparation blanks preserved and analyzed concurrently with the submitted samples.

If you have any questions or concerns regarding this report, please feel free to contact me.

Sincerely,

Russell Gerads
Vice President
Applied Speciation and Consulting, LLC

Total Mercury & Selenium Speciation Results for Duke Energy
Project Name: Allen - FGD WWTS (Bi-Monthly Sampling)
Contact: Jay Perkins
LIMS #J13030385

Date: April 18, 2013
Report Generated by: Russell Gerads
Applied Speciation and Consulting, LLC

Sample Results

Sample ID	Total Hg	Se(IV)	Se(VI)	SeCN	MeSe(IV)	SeMe	Unknown Se Species (n)
FGD Purge Eff	NR	1760	92.5	73.7	11.6	ND (<2.1)	32.1 (1)
BioReactor 1 Inf	2.51	734	188	4.95	57.7	ND (< 0.53)	7.91 (2)
BioReactor 2 Inf	0.132	NR	NR	NR	NR	NR	NR
Bioreactor 2 Eff	1.25	1.46	ND (< 0.35)	0.94	ND (< 0.53)	ND (< 0.53)	0.00 (0)

All results reflect the applied dilution and are reported in µg/L
NR = Analysis not requested
ND = Not detected at the applied dilution
SeCN = Selenocyanate
MeSe(IV) = Methylseleninic acid
SeMe = Selenomethionine
Unknown Se Species = Total concentration of all unknown Se species observed by IC-ICP-MS
n = number of unknown Se species observed

Total Mercury & Selenium Speciation Results for Duke Energy
Project Name: Allen - FGD WWTS (Bi-Monthly Sampling)
Contact: Jay Perkins
LIMS #J13030385

Date: April 18, 2013
Report Generated by: Russell Gerads
Applied Speciation and Consulting, LLC

Quality Control Summary - Preparation Blank Summary

Analyte (µg/L)	PBW1	PBW2	PBW3	PBW4	Mean	StdDev	eMDL*	eMDL 5x	eMDL 250x	eMDL 1000x
Hg	0.0001	0.0000	0.0001	0.0003	0.0001	0.0001	0.0001	0.0004	-	-
Se(IV)	-0.003	0.013	0.007	0.010	0.007	0.007	0.003	-	0.72	2.9
Se(VI)	0.000	0.000	0.000	0.000	0.000	0.000	0.001	-	0.35	1.4
SeCN	0.000	0.000	0.000	0.000	0.000	0.000	0.002	-	0.52	2.1
MeSe(IV)	0.000	0.000	0.000	0.000	0.000	0.000	0.002	-	0.53	2.1
SeMe	0.000	0.000	0.000	0.000	0.000	0.000	0.002	-	0.53	2.1

eMDL = Estimated Method Detection Limit
*Please see narrative regarding eMDL calculations

Quality Control Summary - Certified Reference Materials

Analyte (µg/L)	CRM	True Value	Result	Recovery
Hg	NIST 1641d	1568	1648	105.1
Se(IV)	LCS	4.79	4.530	94.7
Se(VI)	LCS	4.74	4.269	90.1
SeCN	LCS	4.46	4.095	91.8
MeSe(IV)	LCS	3.24	3.009	93.0
SeMe	LCS	4.66	4.226	90.7

Total Mercury & Selenium Speciation Results for Duke Energy
Project Name: Allen - FGD WWTS (Bi-Monthly Sampling)
Contact: Jay Perkins
LIMS #J13030385

Date: April 18, 2013
Report Generated by: Russell Gerads
Applied Speciation and Consulting, LLC

Quality Control Summary - Matrix Duplicates

Analyte (µg/L)	Sample ID	Rep 1	Rep 2	Mean	RPD
Hg	Batch QC	0.0686	0.0690	0.0688	0.6
Se(IV)	Bioreactor 2 Eff	1.46	1.69	1.58	14.6
Se(VI)	Bioreactor 2 Eff	ND (< 0.35)	ND (< 0.35)	NC	NC
SeCN	Bioreactor 2 Eff	0.94	1.07	1.00	12.8
MeSe(IV)	Bioreactor 2 Eff	ND (< 0.53)	ND (< 0.53)	NC	NC
SeMe	Bioreactor 2 Eff	ND (< 0.53)	ND (< 0.53)	NC	NC

ND = Not detected at the applied dilution
NC = Value was not calculated due to one or more concentrations below the eMDL

Quality Control Summary - Matrix Spike/ Matrix Spike Duplicate

Analyte (µg/L)	Sample ID	Spike Conc	MS Result	Recovery	Spike Conc	MSD Result	Recovery	RPD
Hg	Batch QC	2.000	2.160	104.5	2.000	2.139	103.5	0.9
Se(IV)	Bioreactor 2 Eff	1390	1570	112.9	1390	1584	113.9	0.9
Se(VI)	Bioreactor 2 Eff	1261	1235	97.9	1261	1237	98.1	0.1
SeCN	Bioreactor 2 Eff	1144	914.5	79.9	1144	921.2	80.5	0.7

CHAIN OF CUSTODY RECORD AND ANALYSIS REQUEST FORM

DISTRIBUTION
ORIGINAL to LAB,
COPY to CLIENT

DUKE ENERGY®

Duke Energy Analytical Laboratory
Mail Code MGO3A2 (Building 7405)
13339 Hagers Ferry Rd
Huntersville, N. C. 28078
(704) 875-5245
Fax: (704) 875-4349

Analytical Laboratory Use Only

LIMS # J13030385 | MATRIX: OTHER | Samples Originating From: NC ___ SC ___

Logged By: RH | Date & Time: 4/2/13 0824 | Cooler Temp (C): 24

SAMPLE PROGRAM: Water ___ Ground ___ NPDES ___ Drinking Water ___ UST ___ RCRA Waste ___

AS&C
PO#133241

1)Project Name	Allen - FGD WWTS (Bi-Monthly Sampling)
2)Phone No:	
2) Client:	Don Scruggs, Robbin Jolly, Bill Kennedy
4)Fax No:	
5)Business Unit:	20003
6)Process:	BMCEMGP
Mail Code:	
8)Oper. Unit:	AS00
9)Res. Type:	
10)Resp. Center:	

Customer must Complete

MR #

Customer to complete all appropriate non-shaded areas.

Sampling conducted: 2nd and 4th Monday

[15]Preserv.: 1=HCl 2=H_2SO_4 3=HNO_3 4=Ice 5=None

[16]Analyses Required

LAB USE ONLY [11]Lab ID	Se Speciation Bottle ID	[13]Sample Description or ID	Date	Time	Signature	[17]Comp.	[18]Grab	TDS (4)	Br (Dionex) (4)	Metals* + Hg 245.1 (3,4)	Se, soluble (no dig.) (3,4)	Hg 200.8 (V_AS&C) (5)	Se, speciation - vendor to AS&C (Important to place filled bottle back into bath baggies) (4)
2013006600		FGD Purge Eff	3/28	1350	Pat Noble			1	1	1	1		1
2013006601		EQ Tank Eff.	3/28	1346	Pat Noble					1	1		
2013006602		BioReactor 1 Inf	3/28	1338	Pat Noble					1**	1	1	1
2013006603		BioReactor 2 Inf	3/28	1340	Pat Noble					1**		1	
2013006604		BioReactor 2 Eff	3/28	1343	Pat Noble				1	1**		1	1
2013006605		Filter Blk	3/28	1400	Pat Noble						1		
2013006606		Metals Trip Blk	3/25	1000	R. Harris					1**			

Filtering of soluble Se performed in the field

Customer to complete appropriate columns to right

Customer to sign & date below - fill out from left to right

1) Relinquished By	Date/Time	2) Accepted By: R. Harris	Date/Time: 4/2/13 0800
3) Relinquished By	Date/Time	4) Accepted By: Nancy Cullison	Date/Time: 4/3/13 9:20 Temp: -0.5°
5)Relinquished By	Date/Time	6)Accepted By:	Date/Time
7)Relinquished By: R. Harris	Date/Time: 4/2/13 1300	8)Accepted By	Date/Time
9)Seal/Locked By: R. Harris	Date/Time: 4/2/13 1300	10) Seal/Lock Opened By	Date/Time
11)Seal/Locked By	Date/Time	12)Seal/Lock Opened By	Date/Time

Comments

* Metals=As, Cd, Cr, Cu, Ni, Se, Ag, Zn by TRM/IMS, B by TRM/ICP 1**=No Hg analyzed

Customer, IMPORTANT! Please indicate desired turnaround.

[22]Requested Turnaround

14 Days ___X___
*7 Days ___
*48 Hr ___
*Other ___
* Add. Cost Will Apply

4-16-13

CHAIN OF CUSTODY RECORD AND ANALYSIS REQUEST FORM

DUKE ENERGY®

Duke Energy Analytical Laboratory
Mail Code MGO3A2 (Building 7405)
13339 Hagers Ferry Rd
Huntersville, N. C. 28078
(704) 875-5245
Fax: (704) 875-4349

Analytical Laboratory Use Only

LIMS # J13030385 | MATRIX OTHER | Samples Originating From NC ___ SC ___

Logged By RL | Date & Time 4/2/13 0824 | Cooler Temp (C) 2.4

SAMPLE PROGRAM: Water ___ Ground ___ NPDES ___ Drinking Water ___ UST ___ RCRA Waste ___

AS&C PO#133241

[19]Page 1 of 2

DISTRIBUTION
ORIGINAL to LAB,
COPY to CLIENT

Customer must Complete

[1]Project Name	Allen - FGD WWTS (Bi-Monthly Sampling)	[2]Phone No:	
[2] Client:	Don Scruggs, Robbin Jolly, Bill Kennedy	[4]Fax No:	
[5]Business Unit:	20003	[6]Process: BMCEMGP	Mail Code:
[8]Oper. Unit:	AS00	[9]Res. Type:	[10]Resp. Center:

MR #

Customer to complete all appropriate non-shaded areas.

Sampling conducted: 2nd and 4th Monday

[15]Preserv.: 1=HCL 2=H_2SO_4 3=HNO_3 4=Ice 5=None

[16]Analyses Required

LAB USE ONLY [11]Lab ID	Se Speciation Bottle ID	[13]Sample Description or ID	Date	Time	Signature	[17]Comp.	[18]Grab	TDS (4)	Br (Dionex) (4)	Metals* + Hg 245.1 (3,4)	Se, soluble (no dig.) (3,4)	Hg 200.8 (V_AS&C) (5)	Se, speciation - vendor to AS&C (Important to place filled bottle back into both baggies) (4)
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2013006601		EQ Tank Eff.	3/28	1346	Pat Noble					1	1		
2013006602		BioReactor 1 Inf	3/28	1338	Pat Noble					1**	1	1	1
2013006603		BioReactor 2 Inf	3/28	1340	Pat Noble					1**		1	
2013006604		BioReactor 2 Eff	3/28	1343	Pat Noble				1	1**		1	1
2013006605		Filter Blk	3/28	1400	Pat Noble						1		
2013006606		Metals Trip Blk	3/25	1000	R. Harris					1**			

Filtering of soluble Se performed in the field

Customer to complete appropriate columns to right

Customer to sign & date below - fill out from left to right.

1) Relinquished By	Date/Time	2) Accepted By R. Harris	Date/Time 4/2/13 0800
3) Relinquished By	Date/Time	4) Accepted By	Date/Time
5)Relinquished By	Date/Time	6)Accepted By:	Date/Time
7)Relinquished By R. Harris	Date/Time 4/2/13 1300	8)Accepted By:	Date/Time
9)Seal/Locked By R. Harris	Date/Time 4/2/13 1300	10) Seal/Lock Opened By	Date/Time
11)Seal/Locked By	Date/Time	12)Seal/Lock Opened By	Date/Time

Comments

* Metals=As, Cd, Cr, Cu, Ni, Se, Ag, Zn by TRM/IMS, B by TRM/ICP 1**=No Hg analyzed

Customer, IMPORTANT! Please indicate desired turnaround.

[22]Requested Turnaround

14 Days ____X____

*7 Days ____

* 48 Hr ____

*Other ____

* Add. Cost Will Apply

4-16-13